

# Geographic Information Systems: A World of Their Own

The Geographic Information Systems (GIS) section is the mapmaking arm of DEQ. Modern technology has allowed the Agency to use satellite imagery and aerial photography in its everyday protection of the state of Louisiana. The GIS section's ability to adapt quickly to ever-changing technology makes them one of the best in the world.

GIS works with all sections of the Department to bring data and maps together. Paul Zundel, Information Technology Deputy Director and head of GIS, said, "As you know, a picture is worth a thousand words. When people actually see where things are located, it gives them a much better perspective."

The maps have various uses. They can be put together for planning and assessment, models of "what if" scenarios, environmental justice, permits, enforcement, hearings, and litigation.

The maps are made by using various geographic software packages along with numerous data sets. All of the maps produced by DEQ are to scale (they are measurable), have a North directional arrow and are constructed to DEQ's standard of three meters or less accuracy on a Global Positioning System (GPS) point. Satellite imagery and/or aerial photography play a major role in the process.

GIS purchases most of their satellite imagery. Some of it comes from the NASA-owned LANDSAT (Land Satellite) Thematic Mapper which acquires multi-spectral imagery (called scenes) of the Earth. That means that the image contains the visible part of the spectrum and the longer waves of radiation that are undetectable to the human eye. From these images, GIS personnel can select certain bandwidths to produce the kind of map that they need. It can

range from true color, simulated color, panchromatic (black and white) to infrared.

The satellite image is referred to as raster data. Raster-based means an image is composed of many pixels in a grid much like a checkerboard. The raster data is used as the base of a map where-

upon the line data can be fixed. Line data (vector data) consists of the exact locations of sampling sites, churches, graveyards, roads, homes, etc. All like segments are placed together in what is known as a layer. Depending upon what the map needs, layers can be added one at a time to the satellite image. If population characteristics are

requested, they can be added as a side bar. DEQ receives population information from the "TIGER Files" provided by the U.S. Census Bureau.

Some of the satellite images are multi-temporal data. This means that the images have been taken from the same location in space at different times of the year. This allows the GIS section to classify crops, which is currently one



**Brad Mooney and Paul Zundel discuss the content of a map in their viewing area.**

**"It took us over a year to do the Bayou Plaquemine Brule Mapping Project. A lot of us put in a lot of work."**

of its major projects. GIS is working with the Department's Non-Point Source Program (pollution of water bodies from non-specific water run-off) to identify pollution sources and to determine how the flow of water run-off can be managed.

GIS created a scientific process to do satellite imagery classification on multi-temporal data. In the identification of crops, the multi-temporal data shows the vegetation and the specific changes that take place during the growing season.

Brad Mooney, an Information Technology Geographic Senior Support Analyst, said, "At certain times during a typical growing season, crops such as soybeans and rice are very different in appearance. By looking at several dates of satellite imagery, we were able to detect crop-specific changes that took place throughout the year."

It is much more detailed, however, than just looking at a satellite image. To be able to identify what a particular crop looks like in an image, they must first determine what crop has been planted and where it is located. The geographers have to look at crop calendars and records to get a general idea of what they are dealing with. Then comes the field work or what they call "groundtruthing."

"Groundtruthing" is a process where GIS staff goes out into the field to try and identify what crop was in an area at the time a satellite acquired the image. The work is very hard and tedious. Paul Zundel said, "It took us over a year to do the Bayou Plaquemine Brule Mapping Project. A lot of us put in a lot of work."

The work has paid off for the group. DEQ's GIS section is 1 of 100 GIS shops in the world that received recognition from the Environmental Systems Research Institute (ESRI) in 1999.

ESRI is an international company and is the largest GIS software manufacturer in the world. DEQ is also the only state agency to have two maps published in the ESRI map book for the year 2000.

ESRI also gave DEQ's GIS section the honor of being a beta test site for their software products. ESRI gives the Agency all of the latest GIS products to test and comment on. "We have input directly to the code writers and that's an enormous benefit," Paul said. "There are not very many people who get that opportunity."

DEQ's GIS section is also putting together a system that will allow Agency employees to tie analytical data and geographic information together.

The system will aid employees in their daily

## Technology Sharing Brings Huge Benefits for Waste Management

DEQ participates along with 32 other states, multiple federal partners, industry participants, and stakeholders in an organization called the Interstate Technology & Regulatory Cooperation (ITRC) Work Group. The main thrust of this organization is to create instruments and strategies that decrease interstate barriers in implementing innovative waste management and remediation technologies.

DEQ is a charter member of the organization. The original group of 18 states was formed in 1995 to discuss ways to expedite waste site clean up. This group found that many federal, state, and local regulations, policies and guidance made it difficult for states to share information on new technologies for remediating sites contaminated with hazardous waste. The inconsistency of regulations across the country, in turn, hindered the technology companies from producing innovative products quickly because the approval process was very cumbersome for each state.

One of the solutions devised by the ITRC was the development and implementation of guidance documents that would allow every state in the organization to accept data collected under another state's oversight. The documents help regulators make quick yet efficient implementa-

tion of new technology for their state in remediating sites. This process also allows technology companies to collect information that will assist in facilitating the multi-state implementation of their products into the regulatory process.

ITRC provides valuable training in new remediation technologies. Hundreds of DEQ staff members have been trained on a variety of different remediation techniques and some have also participated in on-site demonstrations. Hall Bohlinger, DEQ Deputy Secretary and ITRC point of contact said, "It is definitely time well spent and one of the positive benefits to the Department from our ITRC affiliation."

DEQ remains heavily involved in ITRC and will continue to provide the state with the latest innovations for improved service. Hall referred to the organization's benefit to the state, saying, "I think anytime you can clean up contaminated sites faster than you normally would, environmental protection and human health are enhanced, and it's a benefit to everyone."

For additional information regarding ITRC and guidance documents, log on to the ITRC web site at [www.itrcweb.org](http://www.itrcweb.org).